Table S1. Model attribute number key for all 136 possible EarthChem Portal data. Att no. = Model attribute ID number, Att ref. = Reference sample data measurement name taken from EarthChem Portal.

Att no.	Att ref.		Att no.	Att ref.
0	SiO_2		68	U-235/Pb-204
1	TiO_2		69	Th-232/Pb-204
2	Al_2O_3		70	Po-210/Th-230
3	Fe_2O_3		71	U-238/Pb-204
4	Fe_2O_3T		72	Ba
5	FeO		73	W
6	FeOT		74	Ar-37/Ar-39
7	Ra-228/Ra-226		75	Au
8	MgO		76	Xe-129/Xe-132
9	CaO		77	Lu-176/Hf-177
10	U-238		78	Hg
11	Na_2O		79	Os-186/Os-188
12	K_2O		80	Pb-206/Pb-208
13	P-205		81	Ta
14	MnO		82	Pb-210/U-238
15	LOI		83	Sb
16	H_20+		84	Sr-87/Sr-86
17	H_2O-		85	Se
18	H_2O		86	Pb-207/Pb-204
19	Cr_2O_3		87	Pb-206/Pb-204
20	NiO		88	Pb-208/Pb-204
21	La		89	Sn
22	$CaCO_3$		90	S
23	Ce		91	Th-230/U-238
24	Pr		92	Nd-143/Nd-144
25	Nd		93	U
26	Sm		94	Ra-226/Th-230
27	Eu		95	Re
28	Gd		96	I
29	Tb		97	P
30	Dy		98	Y
31	Ho		99	εNd
32	Er		100	Mo
33	Tm		101	Be-10/Be
34	Yb		102	Os-184/Os-188
35	Lu		103	Pd
36	Li		104	Ra-226/Th-228

(Table S1 continued)

Att no.	Att ref.		Att no.	Att ref.
37	Be		105	Te
38	B		106	Pt
39	C		107	Hf
40	CO_2		108	Os-187/Os-186
41	F		109	Cl-36/Cl
42	Cl		110	Ra-228/Th-232
43	Th-230		111	Pb-206/Pb-207
44	K		112	Ir
45	Ca		113	Pb
46	Mg		114	In
47	Sc		115	H
48	Ti		116	Pb-210/Ra-226
49	V		117	Ag
50	Fe		118	Th
51	Cr		119	Tl
52	Mn		120	As
53	Co		121	Hf-176/Hf-177
54	Ni		122	Rb
55	Zn		123	Al
56	Cu		124	Be-10/Be-9
57	Zr		125	Ar-36/Ar-39
58	Ga		126	Cs
59	GER		127	Sr
60	Ra-226		128	K-40/Ar-36
61	Pa-231		129	Bi
62	Th-232		130	Os-187/Os-188
63	U-234/U-238		131	Nb
64	U-234/U-238 Activity		132	Os
65	Th-230/Th-232		133	Pb-208/Pb-206
66	Th-232/Th-230		134	Cd
67	Th-232/U-238		135	SiO_4

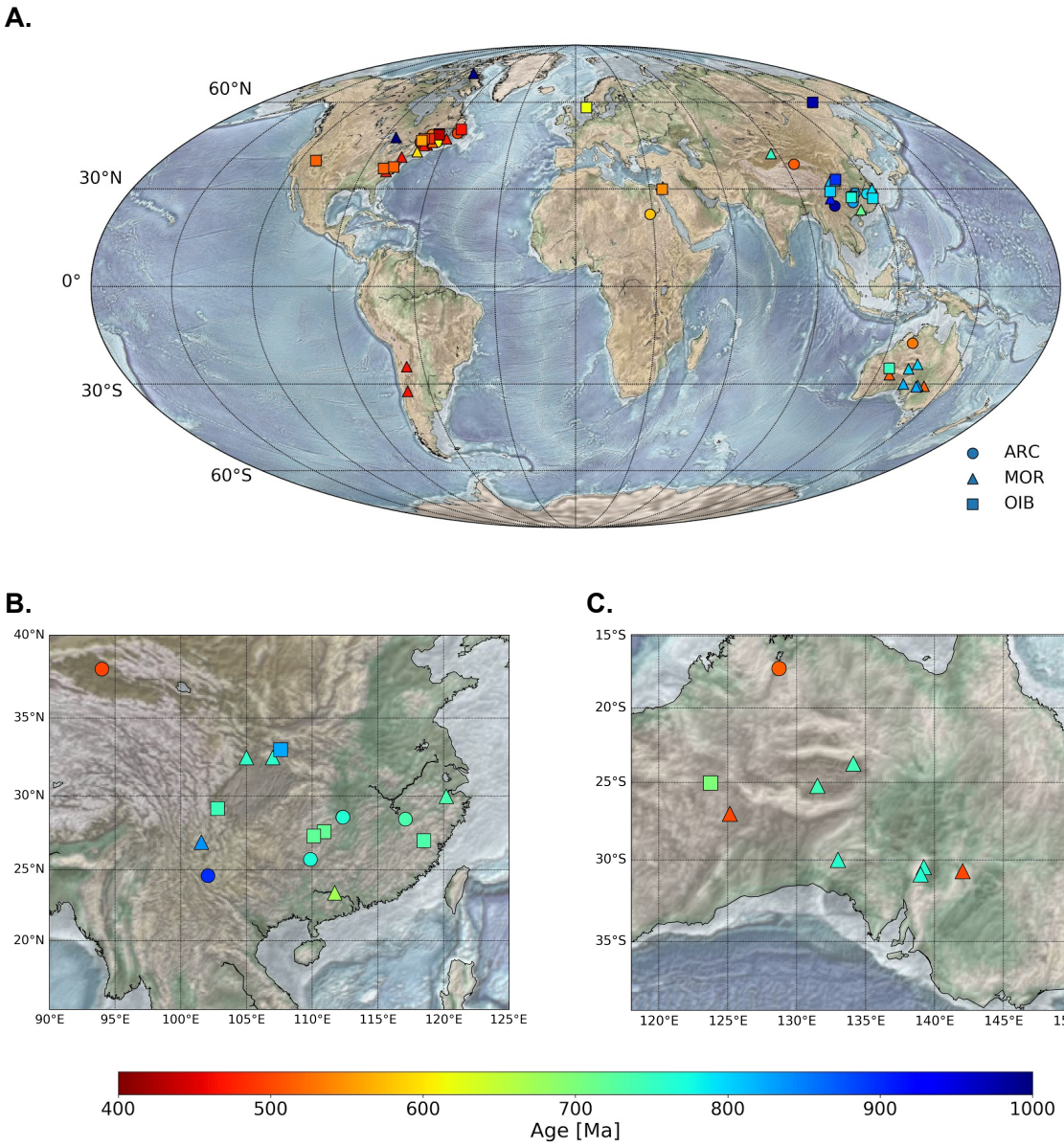
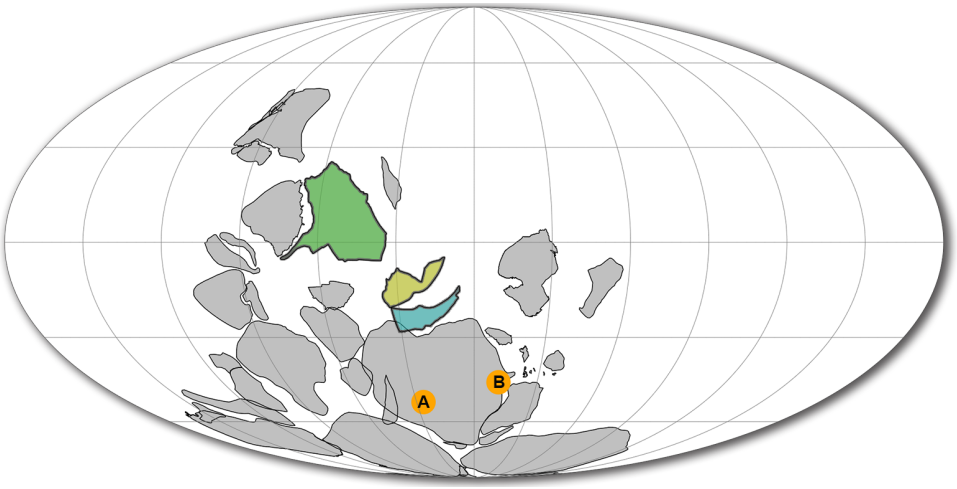


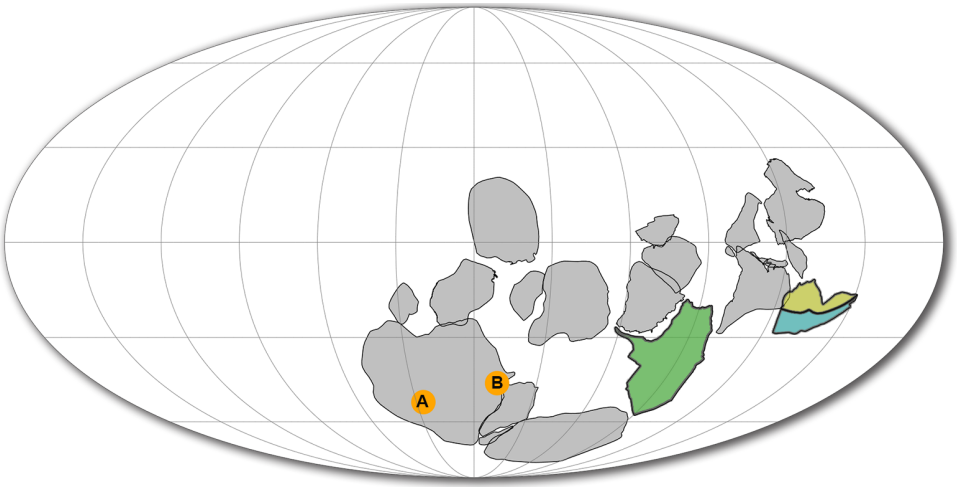
Figure S1. A.) Global distribution of predicted tectonic settings aged 1000-410 Ma are plotted at their present-day mean sample site locations, with B.) and C.) showing the focus regions of China (Yangtze and Cathaysia which together form the South China Block) and Australia (North, South and West Australian cratons plus Paleozoic Tasmanides) used in the case study. ARC predictions are shown as filled circles, MOR as filled triangles and OIB as filled squares. Symbols are color-coded by age. Predictions overlay ETOPO1 (Amante and Eakins, 2009) and global marine gravity (Anderson et al., 2010).

1000 Ma

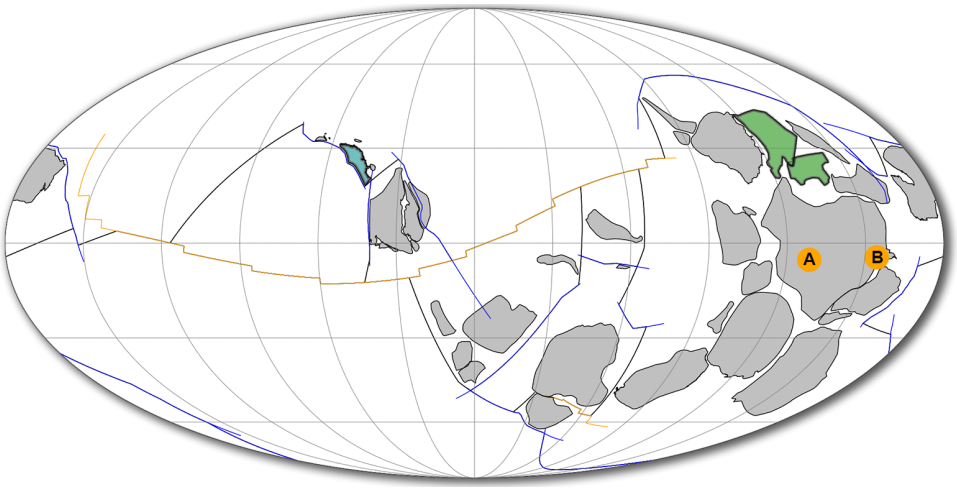
L2008



E2009

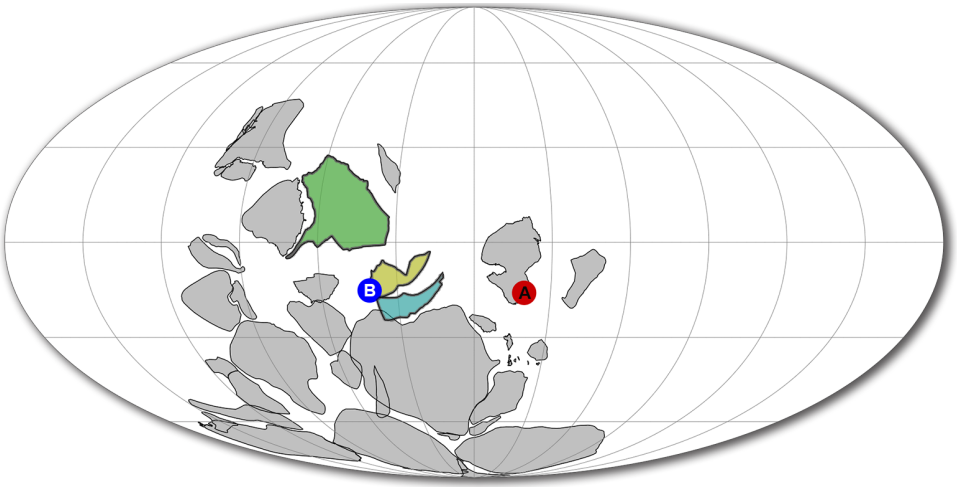


M2016

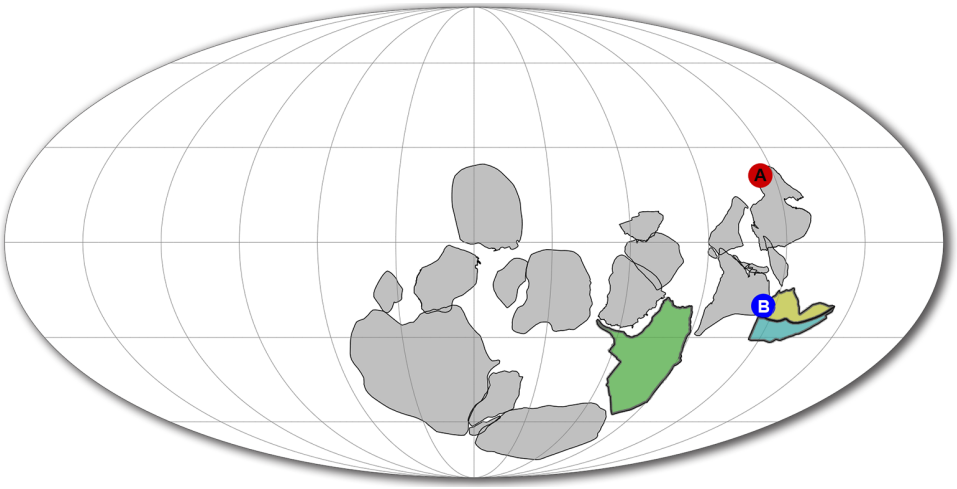


980 Ma

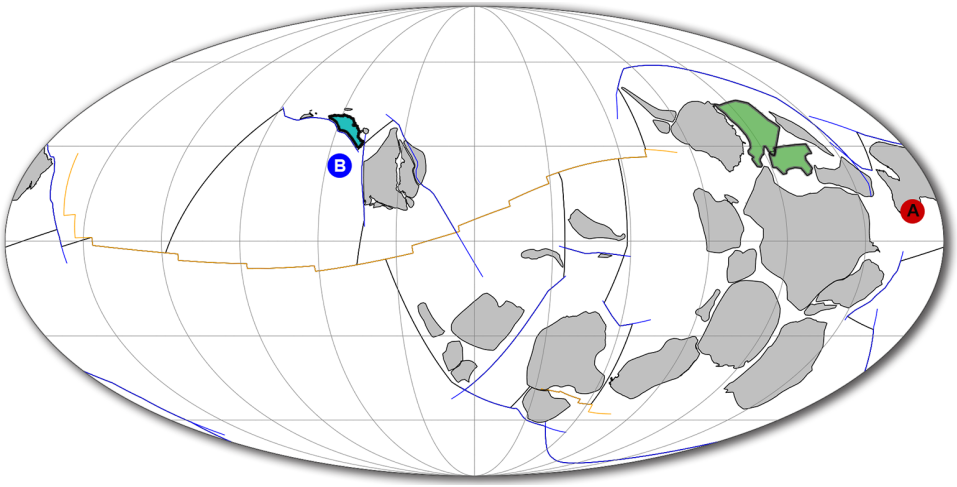
L2008



E2009

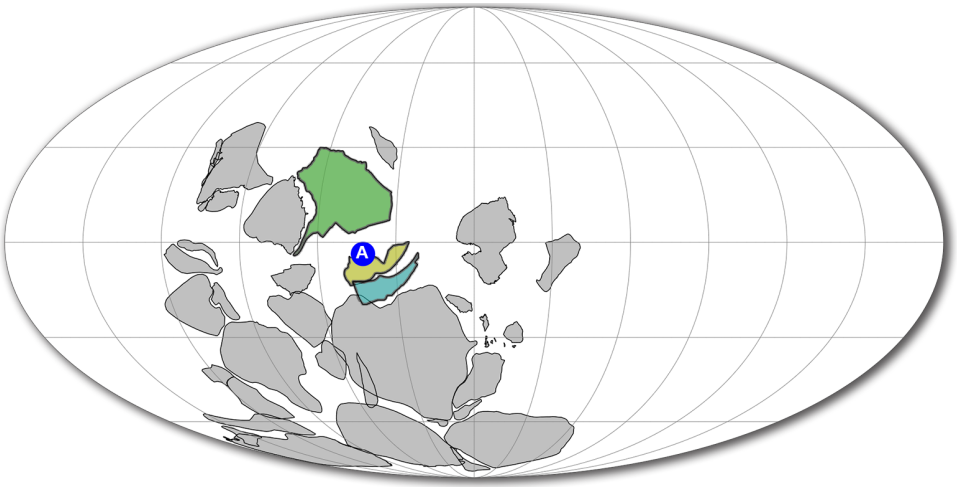


M2016

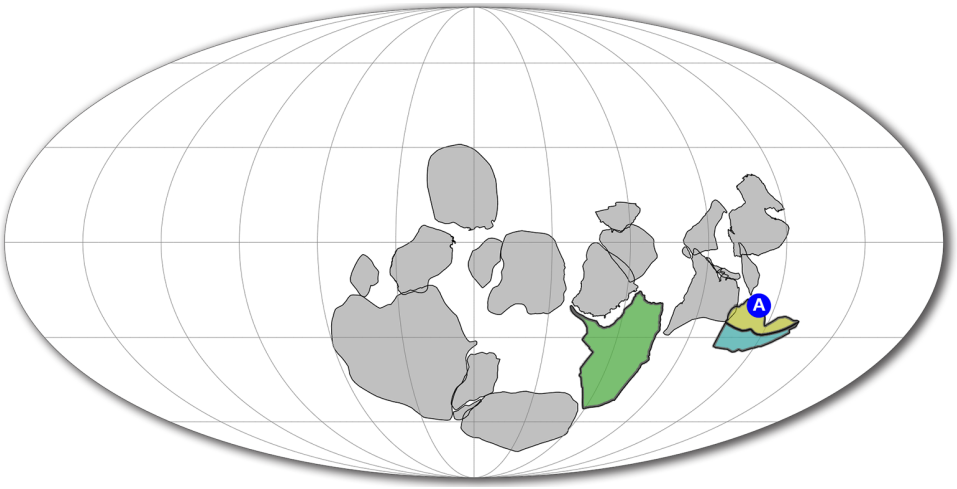


950 Ma

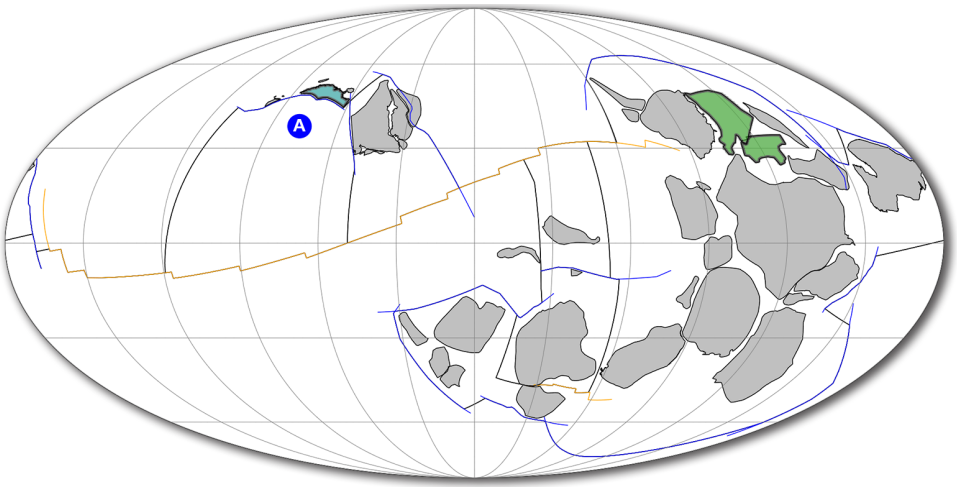
L2008



E2009

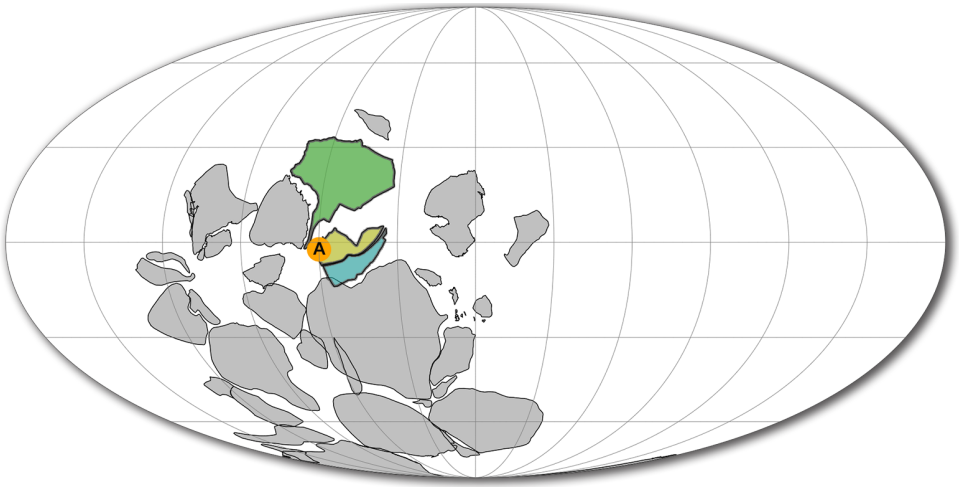


M2016

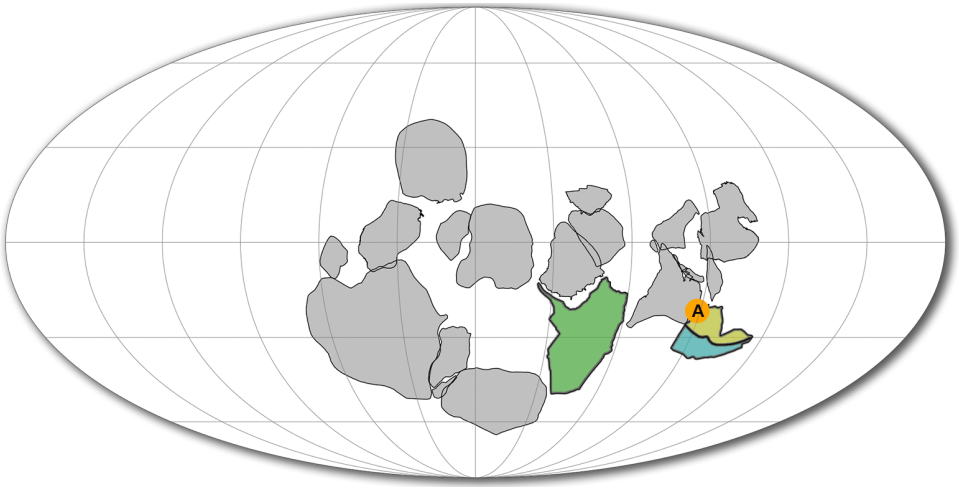


910 Ma

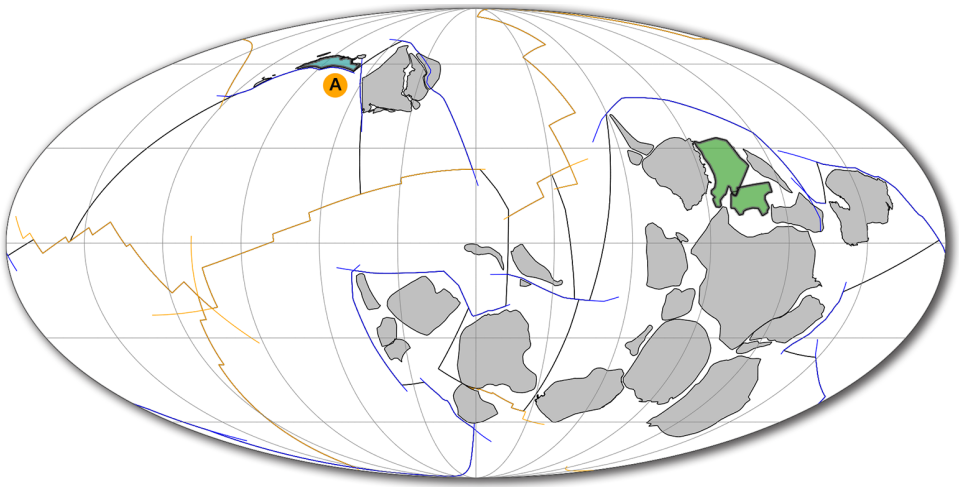
L2008



E2009

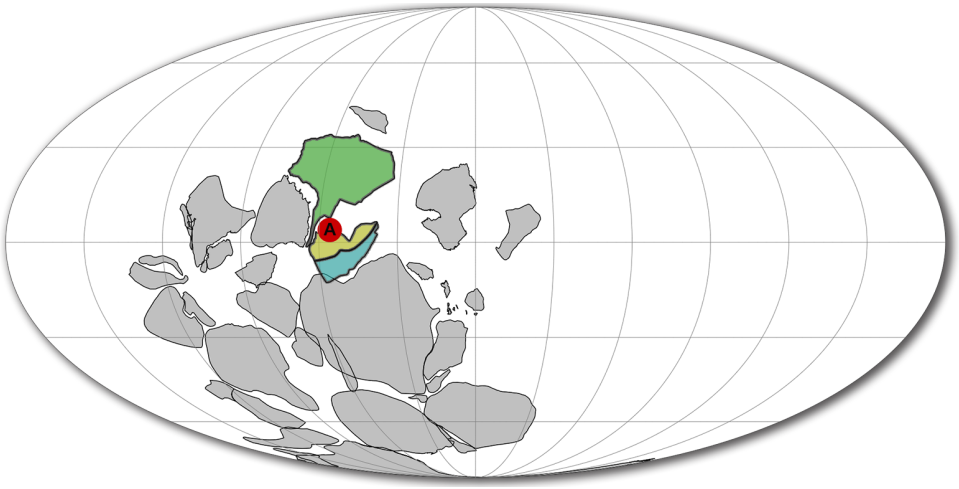


M2016

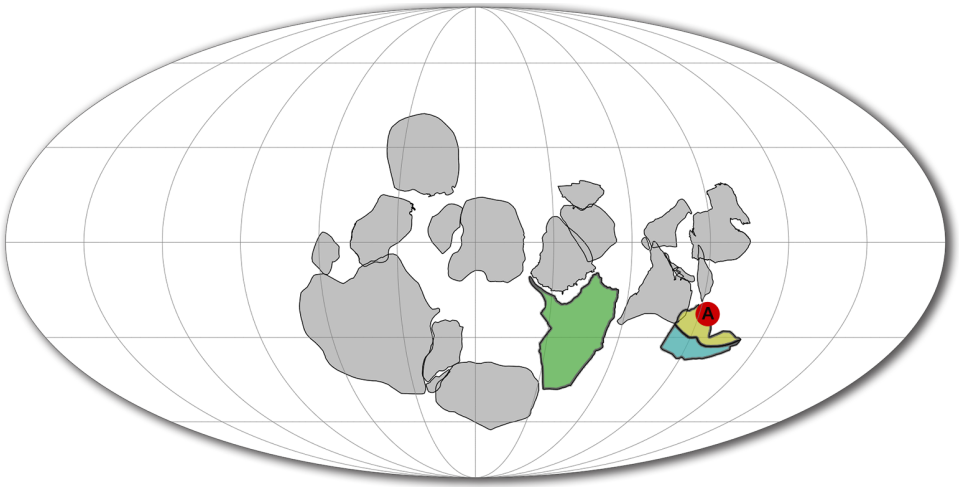


900 Ma

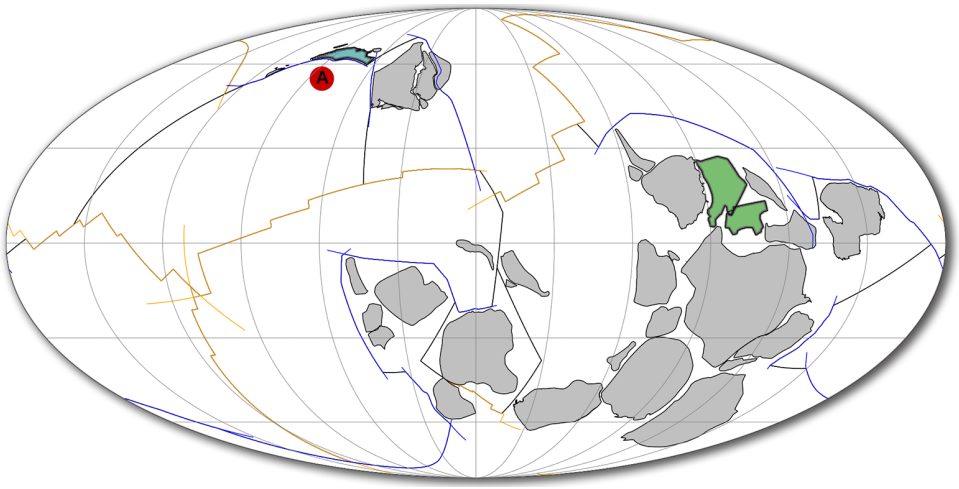
L2008



E2009

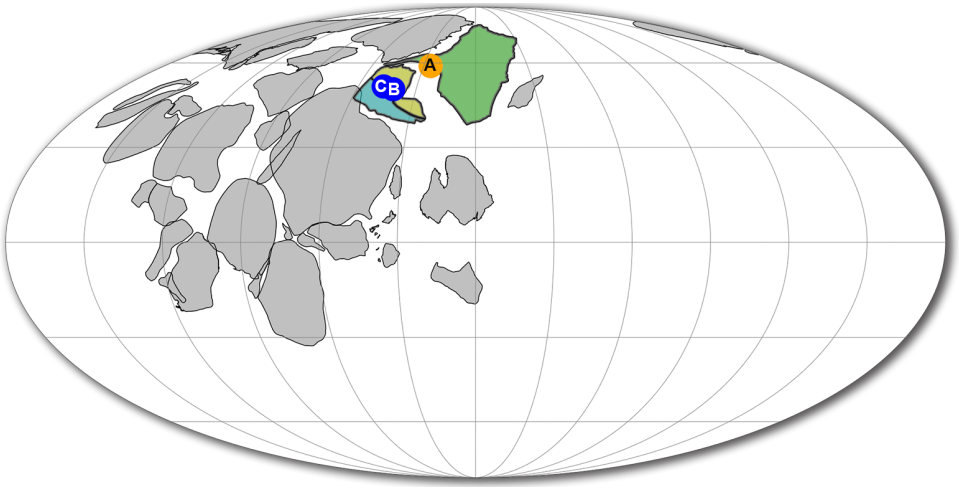


M2016

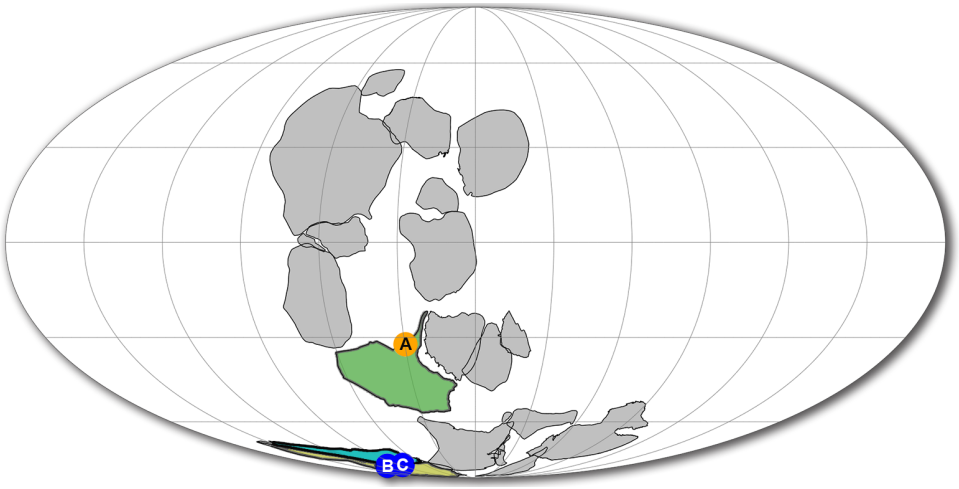


830 Ma

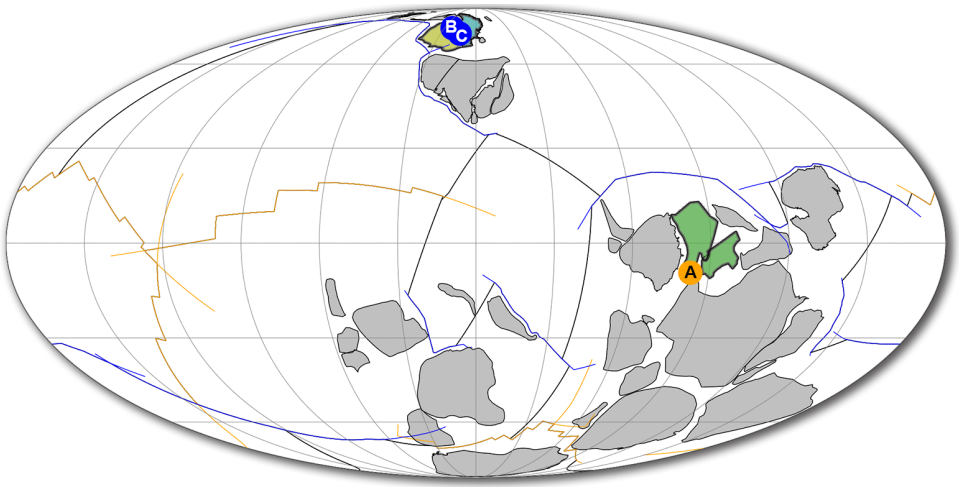
L2008



E2009

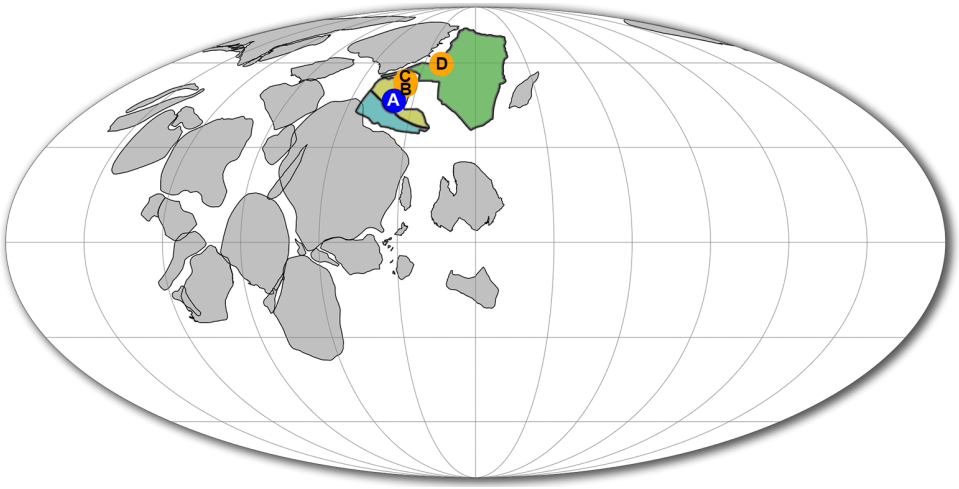


M2016

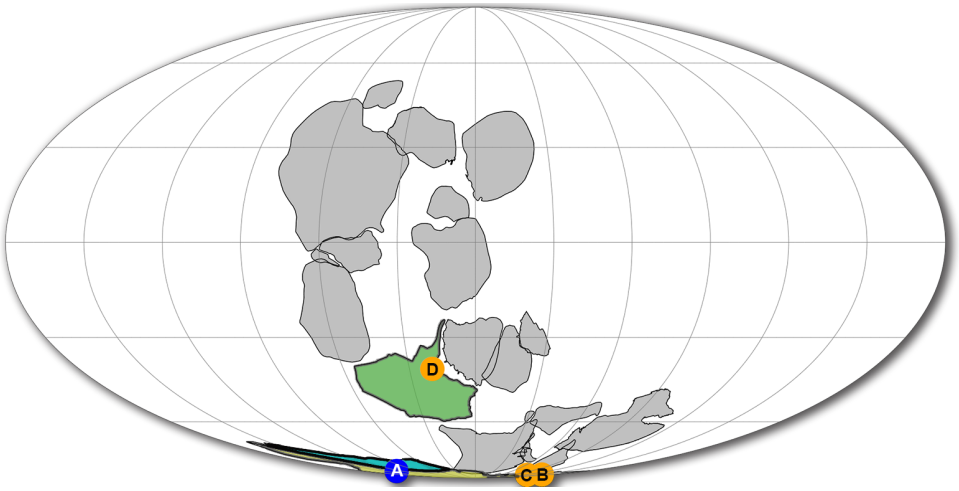


820 Ma

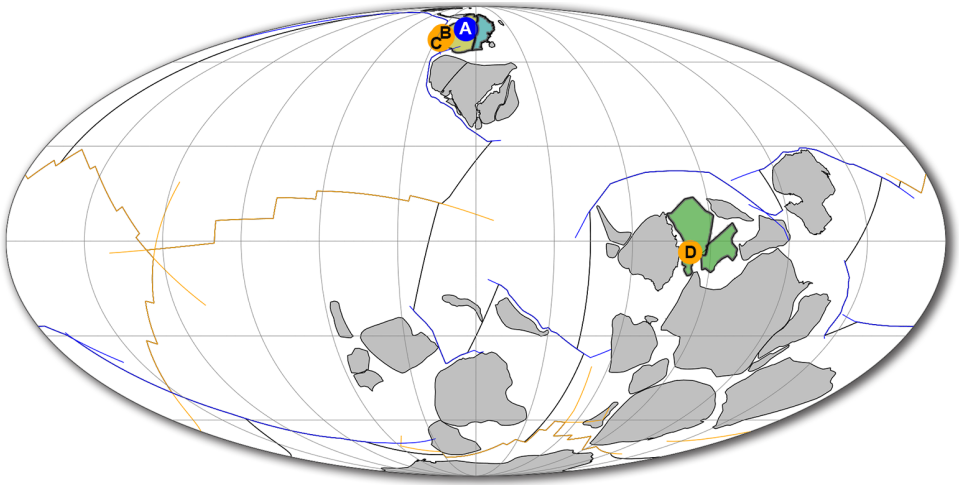
L2008



E2009

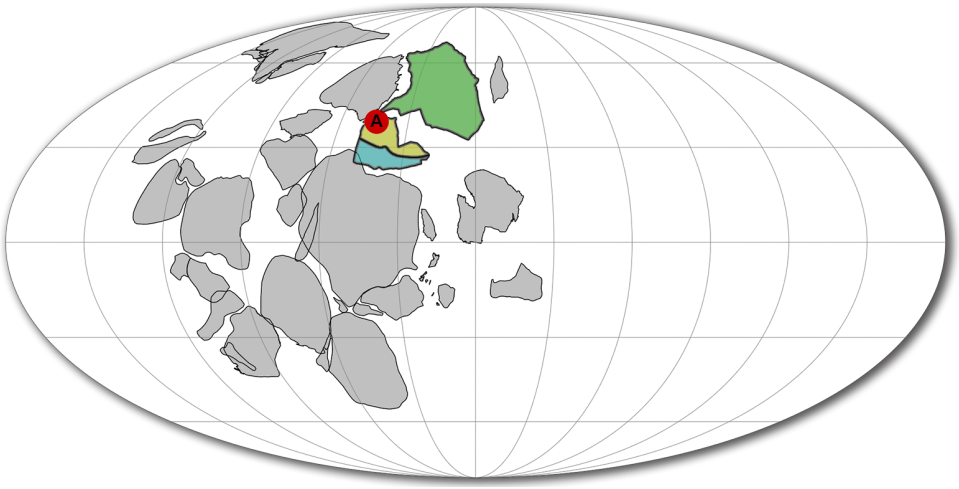


M2016

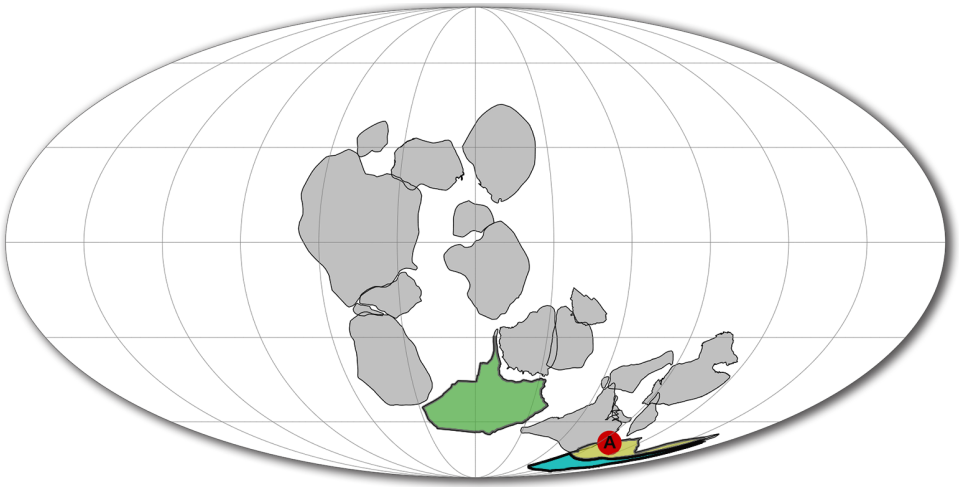


810 Ma

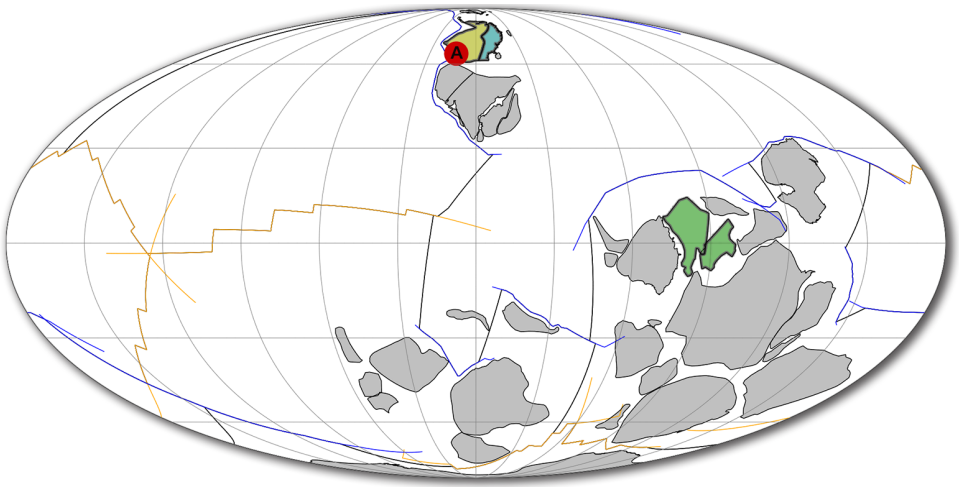
L2008



E2009

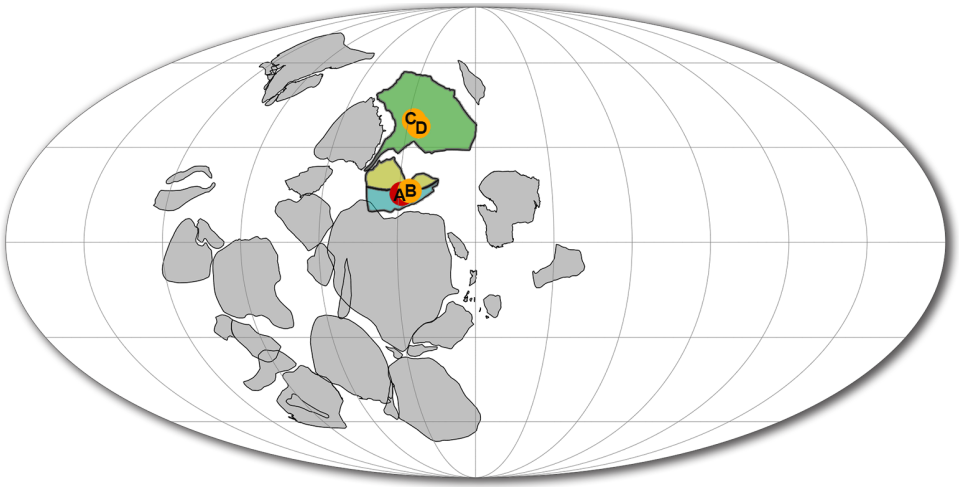


M2016

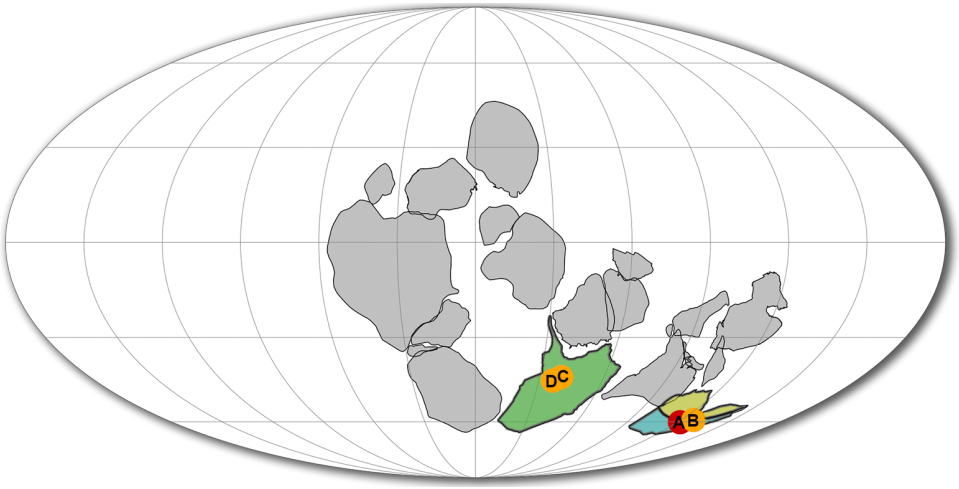


800 Ma

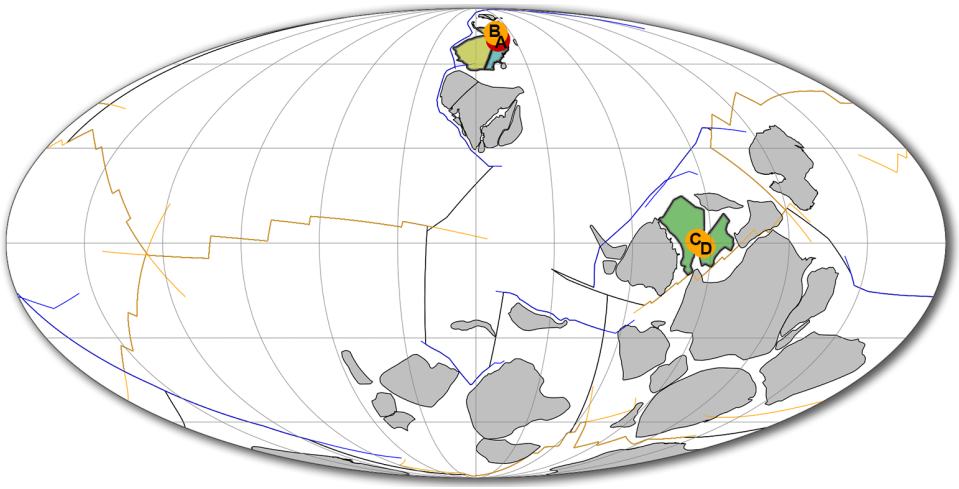
L2008



E2009

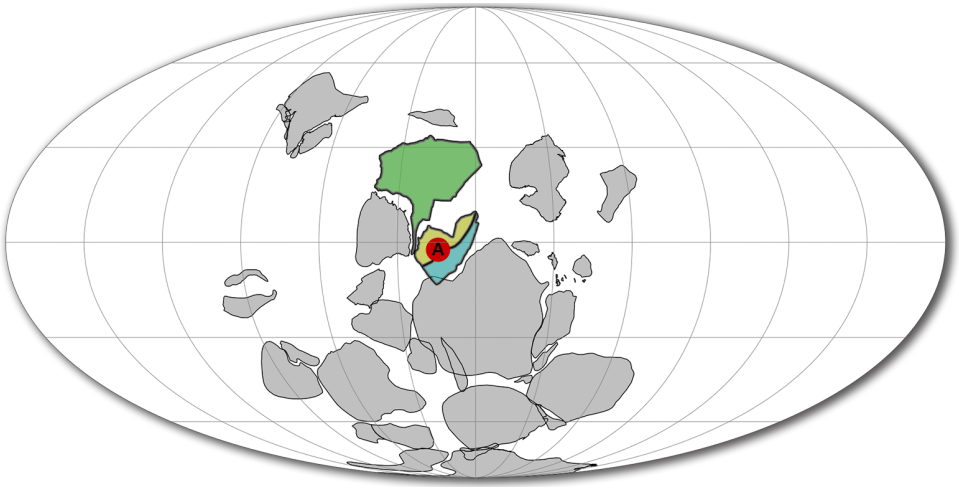


M2016

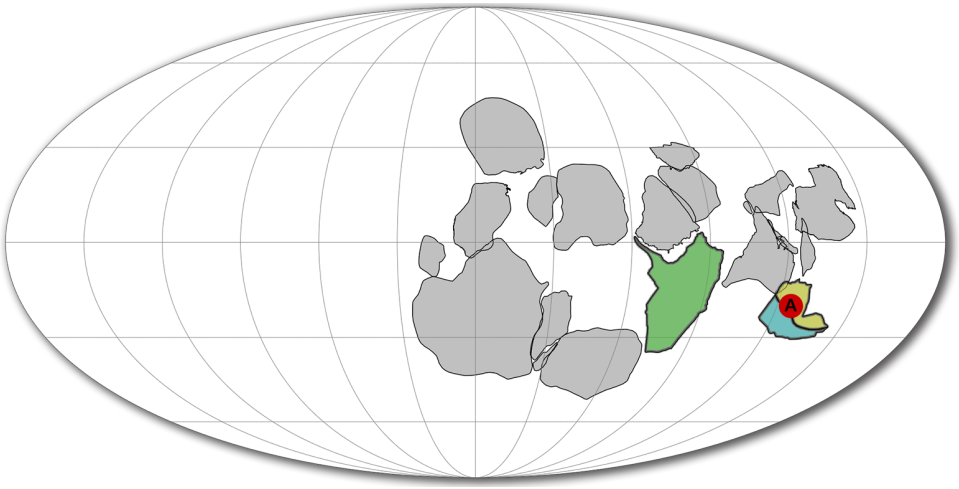


780 Ma

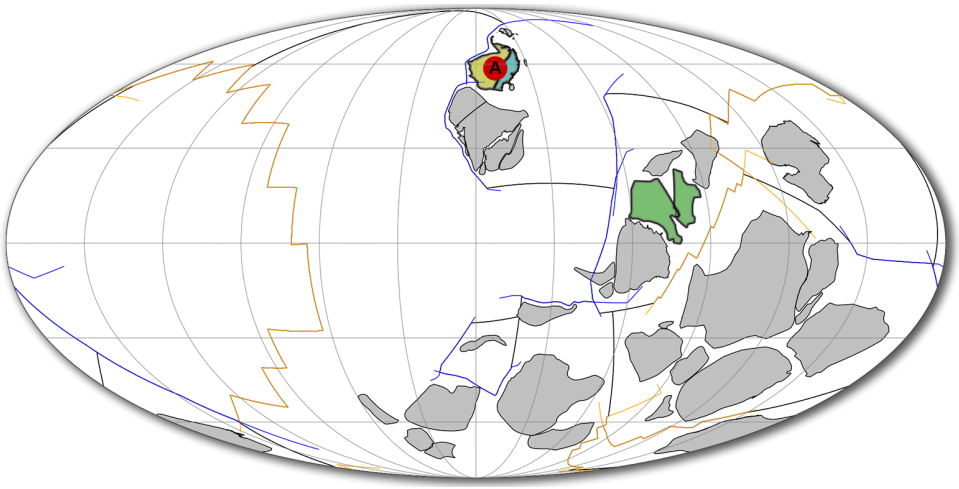
L2008



E2009

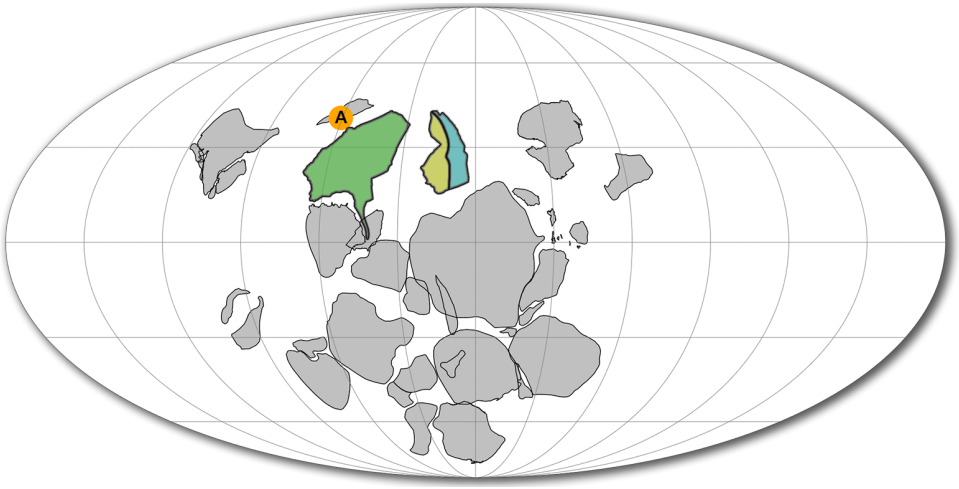


M2016

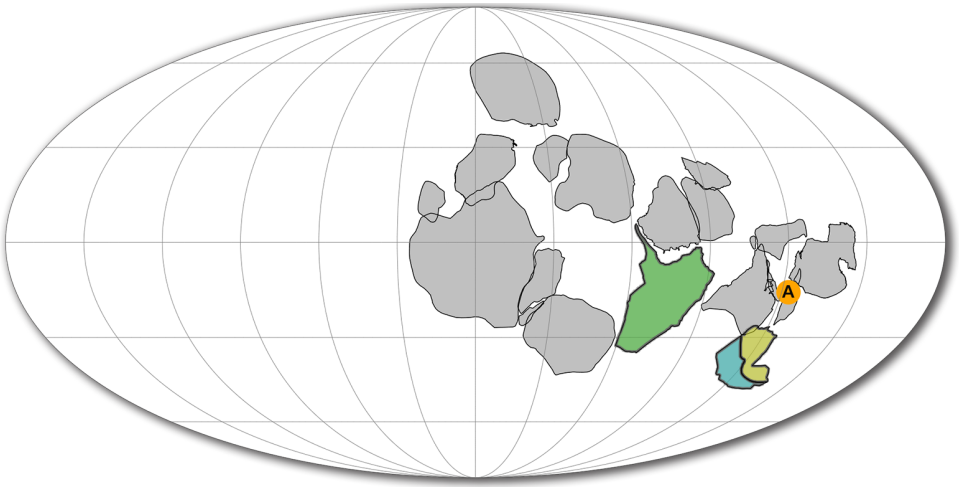


760 Ma

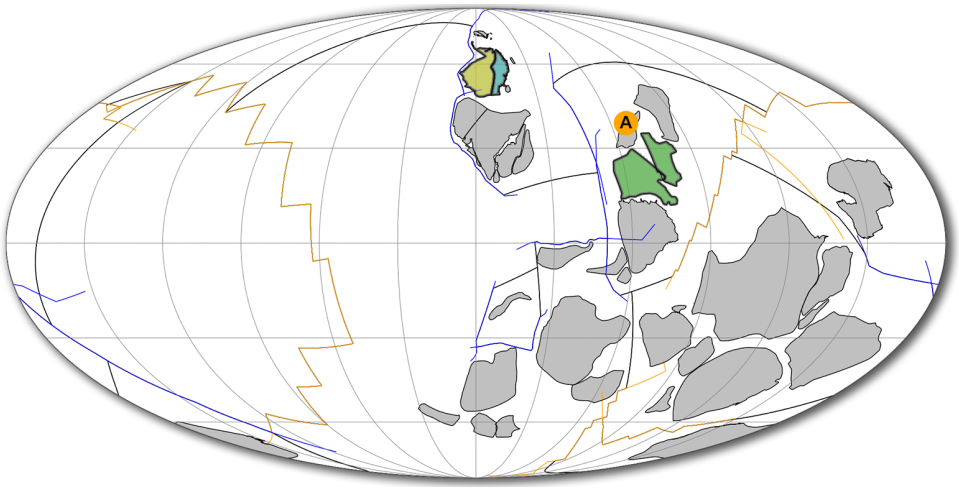
L2008



E2009

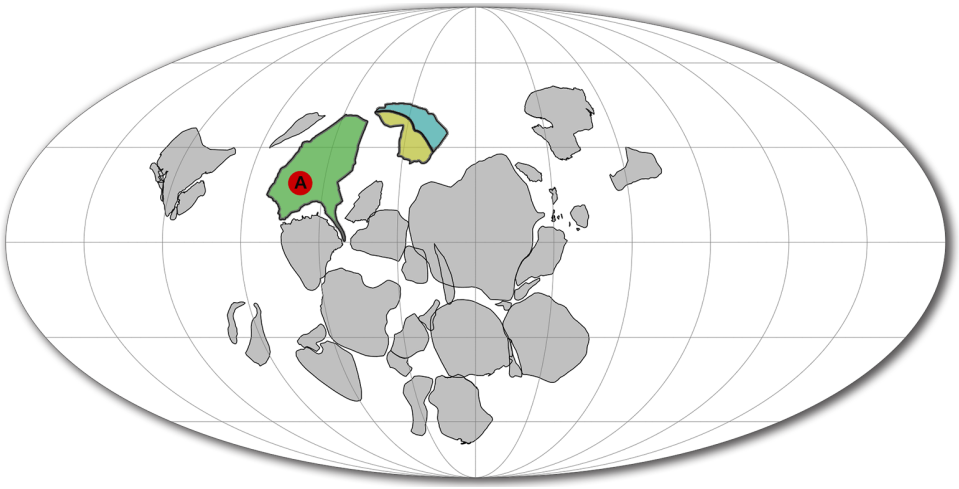


M2016

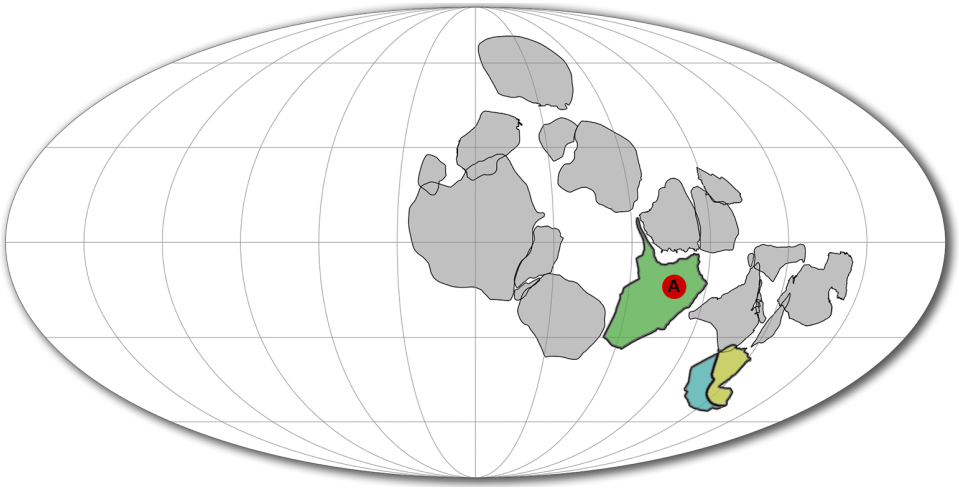


750 Ma

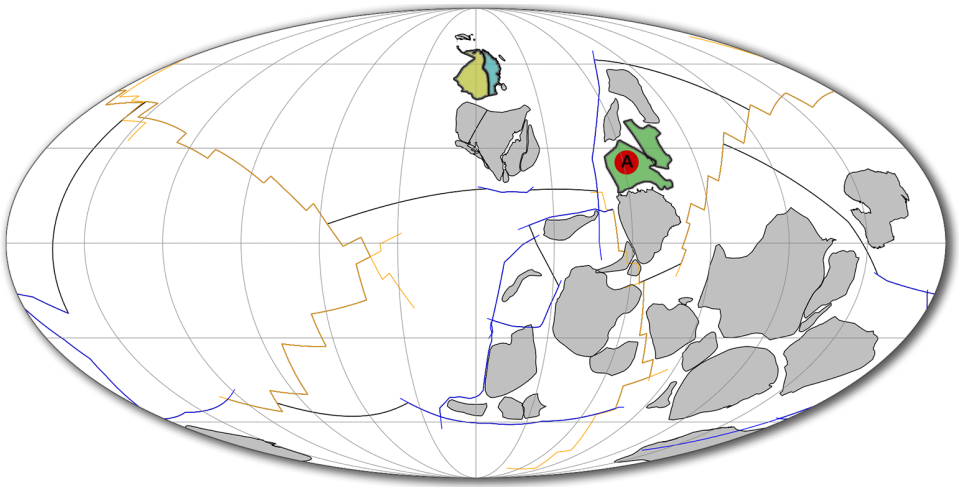
L2008



E2009

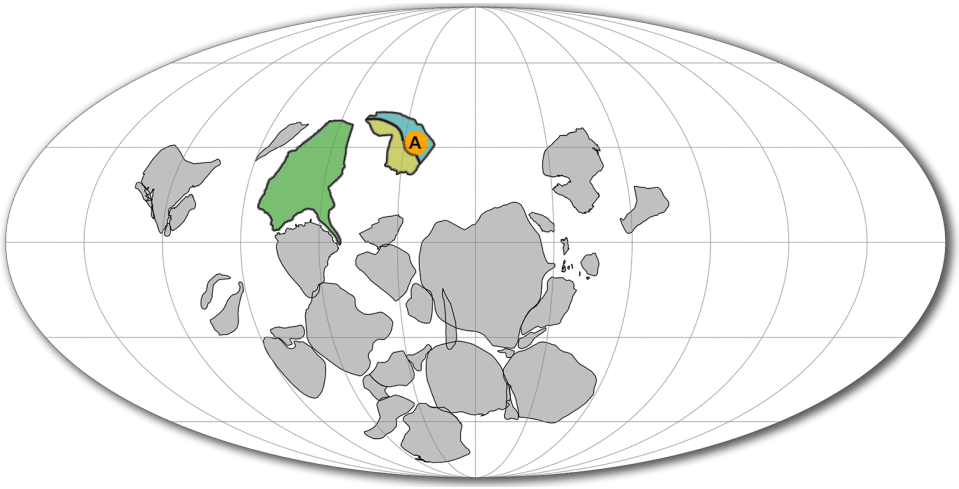


M2016

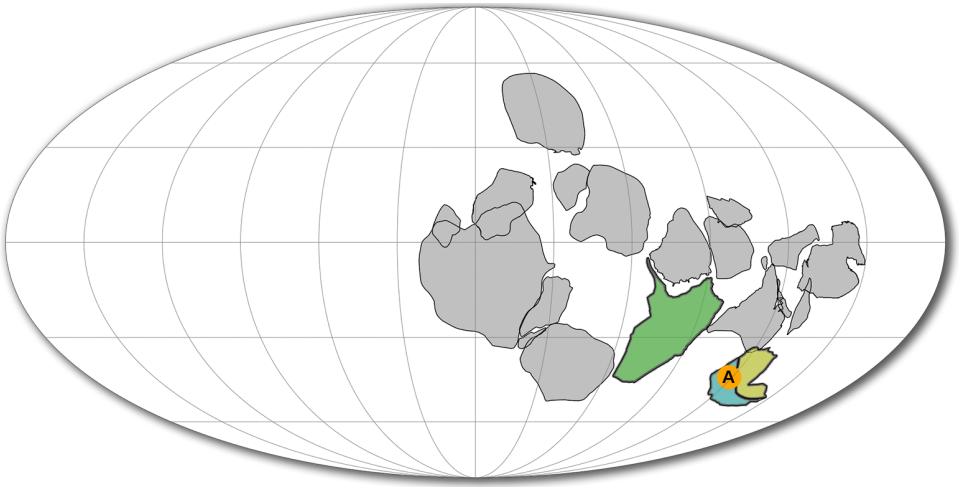


720 Ma

L2008



E2009



M2016

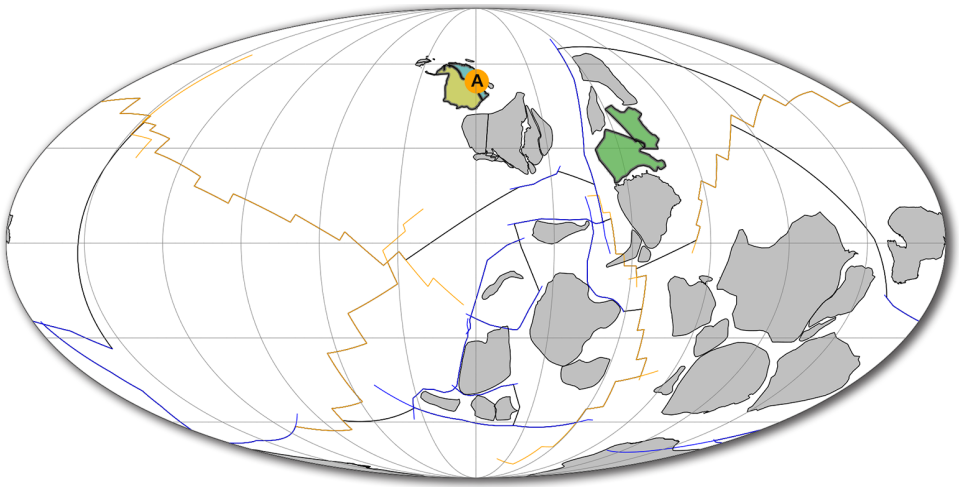


Figure S2 (above). Reconstruction configurations for each Rodinia model and time step as discussed in the case study. L2008 = Li et al. (2008), E2009 = Evans (2009), and M2017 = Merdith et al. (2017). Tectonic environment predictions overlay map and are labelled by prediction ID (Tabel 2 in main text). Blue, orange and red circles represent ARC, MOR and OIB predictions respectively. Green filled polygons = Australia, cyan filled polygons = Cathaysia, and yellow filled polygon = Yangtze.